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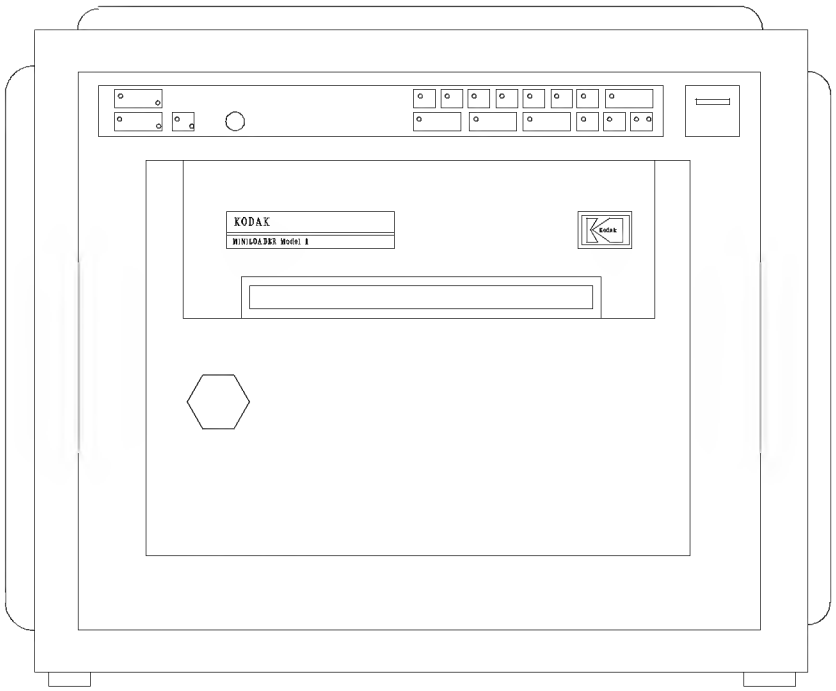
THEORY GUIDE

for the

Kodak MINILOADER 1



Use this Publication for:-
MINILOADER 1 Stand-alone (SV code 3234), and MINILOADER 1 Processor Interface (SV code 3235). Serial numbers 1217 and up, plus 1101 - 1216 with serial number suffix M.

HEALTH SCIENCES DIVISION

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CAUTION

This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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Changes to the cycle on MINILOADERS with serial number 1217 and up

RELAYS KR4B and KR4C are added.

Double FILM detection in one position after MS4 operates.

Contact T1A-1 added in line 50A.

"Cassette entered" light stays on during the complete cycle.

"Low film" alarm inhibited during Serial Unload.

"Cassette abort" lamp stays on in memory.

"Cassette entered incorrectly" lamp stays on in memory.

MS9 and MS10 low voltage interlocks have been replaced by S26 and S27 (high voltage interlocks).
NOTE: On rebuilt machines with SERIAL NUMBERS 1101M - 1216M, MS9 and MS10 remain in the low voltage line.

In SERIAL MODE the "LOW FILM" ALARM is turned off automatically.

NORMAL SEQUENCE - BRIEF DESCRIPTION.

Inserting a CASSETTE with the LATCH first and uppermost interrupts PHOTOCELL FC2. With the CAM in the home position, MICROSWITCH MS1 is energized. The interruption of PHOTOCELL FC2 energizes the CONVEYOR BELT MOTOR forward.

The CONVEYOR BELT carries the CASSETTE to the END STOP where it is detected by PHOTOCELL FC1 receiving a signal from the REFLECTIVE PATCH on the CASSETTE LID.

The signal from PHOTOCELL FC1 stops the CONVEYOR BELT MOTOR with the CASSETTE in position at the END STOP. The PHOTOCELL FC1 signal also starts the CAM MOTOR forward.

The CAM forward motion starts the CASSETTE opening cycle. The CLAW releases the CASSETTE LATCH and lifts the LID

MICROSWITCH MS5 operates to check that PHOTOCELL FC3 has been interrupted by the CASSETTE LID. PHOTOCELL FC3 indicates that the CASSETTE has opened.

MICROSWITCH MS17 operates to stop the CAM with the CASSETTE open 10 mm to allow the INJECTOR to operate to try to ensure the film is released from the top screen

MICROSWITCH MS3 operates to check that there is not a FILM stuck to the UPPER SCREEN. On a normal cycle PHOTOCELL FC4 can see the REFLECTIVE PATCH on the UPPER SCREEN and the cycle will continue. A dwell period is provided on the CAM to allow this check to happen whilst the CAM is moving. If a film is stuck to the UPPER SCREEN, then the CAM is stopped to allow air to be injected in pulses to release the FILM to enable it to drop into its correct position on the LOWER SCREEN. TIMER T3 controls this period and restarts the CAM on completion of this operation. The mark/space ratio of this blowing is controlled by TIMERS TL & L.

The CAM continues and de-activates MICROSWITCH MS3. AT this point PHOTOCELL FC1 checks that the EXPOSED FILM has been removed from the CASSETTE.

MICROSWITCH MS8 operates to check PHOTOCELL FC7 (and PHOTOCELL FC 9 if a VERTICAL INTERFACE with a PHOTOCELL is fitted), to see if a film is jammed in the CHUTE - or - the EXPOSED FILM MAGAZINE is full, according to which model it is. If a FILM is jammed or the MAGAZINE is full the vacuum will be turned off to prevent the EXPOSED FILM being picked up

The CAMS continue to rotate bringing the CASSETTE and MAGAZINE SUCKERS down onto the exposed and unexposed films

MICROSWITCH MS2 operates to stop the CAM MOTOR and start TIMERS T4 and T2.
TIMER T4 provides time to pick up the exposed and unexposed films and when it times out after 1 second it starts the TILT MECHANISM which rotates the SUCKERS into the tilt position to separate the FILM.
TIMER T2 controls the tilt time between 0 and 7 seconds (adjustable) to allow time for the film to separate.
When TIMER T2 times out the CAM MOTOR restarts forward.

MICROSWITCH MS7 operates to check PHOTOCELL FC1 to see if the exposed film has been picked up from the CASSETTE.

MICROSWITCH MS4 operates to energize the TILT MOTOR to remove the tilt. At the same time it stops the CAM to enable multiple film detection to be carried out by PHOTOCELL FC8 whilst the FILM is stationary. TIMER T8 controls this time and restarts the CAM when it times out.
MICROSWITCHES MS13 and MS15 de-energize the TILT MOTOR with the SUCKERS in the horizontal position.

The CAM MOTOR continues to rotate, carrying the FILMS to their respective destinations.

MICROSWITCH MS6 operates to de-energize the SOLENOID VALVES and VACUUM PUMPS to release the exposed and unexposed FILMS into the MAGAZINE or CHUTE and CASSETTE respectively.

MICROSWITCH MS16 operates to check that PHOTOCELL FC1 has detected that an unexposed FILM has been placed in the CASSETTE.

The CAMS complete the cycle and energize MICROSWITCH MS1.

The CONVEYOR BELT is energized in reverse and the cassette is ejected. The CASSETTE interrupts PHOTOCELL FC2 on the way out, which energizes TIMER T6. TIMER T6 allows time for the CASSETTE to be ejected before the CONVEYOR BELT stops.

NORMAL CYCLE - IN DETAIL.

When the cams are in the home position MICROSWITCH MS1 (33) is closed.
At power up FC2 (28), TIMER T12 (36) and "POWER ON "LAMP (38) [via MS11 and MS12] are energised.
TIMER T12 gives time for PHOTOCELL FC2 to stabilise preventing false cycling.

FC2 (28) turns on.
FC2-1 (106A) closes
FC2-2 (36) opens to inhibit RELAY KRM.

RELAYS KR1 (33) KR1A (34) and KR1B (35) are energised via MS-1 (33).
KR1-1 (43) enables RELAYS KN (42), KNA (43), KNB (41) and the COUNTER (44).
KR1-2 (36) enables KRM (36).
KR1A-1 (87) opens to inhibit CAM RELAY KC (87).
KR1A-2 (90) closes
KR1B-1 (58) closes
KR1B-2 (79) closes

Timer T12 (36) times out [1 second] and KT12-2 (36) enables RELAY KRM (36).

When a CASSETTE is entered :-
PHOTOCELL FC2 (24) is interrupted by the CASSETTE. FC2-1 (106A) opens. FC2-2 (36) closes and energises RELAY KRM (36).
KRM-1 (37) self holds RELAY KRM (36).
KRM-2 (40) and KRM-3 (40) complete the -12 volts line and energise CASSETTE entered LAMP (30) and PHOTOCELLS FC1, FC3, FC4, FC5, FC6, FC7 and FC8.
FC1 - nothing happens
FC3-1 (96A) opens.
FC4 - nothing happens
FC5 - nothing happens
FC6 - nothing happens
FC7-1 (134) opens inhibiting KFC7A (134) [film jam in chute]
FC8-2 (139) opens
RELAYS KM1 (144), KS (151), TIMERS T1 (46) and T7 (145) RELAYS KN (42) and KNA (43), KNB (41) and COUNTER (44).
KM1-1 (5) energises the COMPRESSOR.
KS-1 (54A) and KS-2 (80) disable the BELT RETURN and RESET SWITCHES.
KN-1 to 4 (15) energise the CONVEYOR BELT FORWARD.
KNA-1 (108) and KNA-2 (139) open to clear any error lamps from the previous cycle.
KNB-1 (42) changes over to start the FILM PROCESSOR.
SOLENOID VALVE SV5 (137) [pressure vent] is closed.
SOLENOID VALVES SV1 (104) and SV2 (72) [injectors] are energised to allow the COMPRES SOR to start against an open system.

TIMER T7 (145) times out after 1 sec. T7-1 (71) and T7-2 (104) open to close SOLENOID VALVES SV1 and SV2.

As the CASSETTE clears PHOTOCELL FC2 FC2-1 (106A) closes FC2-2 (36) opens, but KRM (36) is self held

When the CASSETTE arrives at the END STOP, PHOTOCELL RELAY FC1 (160) energises by seeing the reflective patch on the LID of the CASSETTE.
FC1-2 (51) energises RELAYS KFC1A (51), KFC1B (51A), KFC1E (52) FC1-1 (53) energises

RELAYS KFC1C (53) and KFC1D (54).
KFC1A-1 (51A) self holds RELAYS KFC1A (51), KFC1B (51A) and KFC1E (52).
KFC1A-2 (43) de-energises RELAYS KN (42) and KNA (43) and KNB (41) and stops TIMER T1 (46).
KN-1 to 4 (15 & 16) de-energise the CONVEYOR BELT FORWARD.
KNA-1 (108) closes
KNA-2 (139) closes
$$ KFC1B-2 {-1 contact?} (119) opens
KFC1B-2 (88) energises KCA (89), KC (87) and starts TIMER T9 (88).
KC-1 to 4 (19 & 20) energise the CAM MOTOR forward.
KCA-1 (58) opens
KCA-2 (87) closes
KFC1C-1 (92) opens
KFC1D-1 (111) closes
KFC1D-2 (108) changes over
KFC1E-1 (96A) closes to enable KFC3A (96A)

As the CAMS leave HOME POSITION MICROSWITCH MS1 (33) opens and de-energises RELAYS KR1 (33), KR1A (34) and KR1B (35).
KR1-1 (43) opens
KR1-2 (36) opens but KRM (36) is self held
KR1A-1 (87) closes to maintain RELAY KC (87) and KCA (89) to keep the CAM MOTOR running.
KR1A-2 (90) opens
KR1B-1 (58) opens
KR1B-2 (79) opens

The SHOVEL opens the CASSETTE LID which interrupts PHOTOCELL FC3 energising RELAY FC3 (160).
FC3-1 (96A) energises RELAY KFC3A (96A).
KFC3A-1 (97) self holds RELAY KFC3A (96A).
KFC3A-2 (62) opens

Note: KFC1E-1 (96A) ensures that PHOTOCELL FC3 does not lock-up immediately PHOTOCELL FC2 is interrupted.

MICROSWITCH MS5 (62) operates to check if CASSETTE LID has opened. On a normal cycle the lid will have opened and KFC3A-2 (62) will inhibit RELAYS KRX (62) KRXA (63) and T5A (61A).

MS5 (62) opens as cam rotates

FC1 (160) losses sight of the cassette lid patch
FC1-1 (53) opens and de-energises KFC1C (53) and KFC1D (54)
FC1-2 (51) opens
KFC1C-1 (92) closes
KFC1D-1 (111) opens
KFC1D-2 (118) closes
The opening cycle continues and MS17 (101A) operates via MS3 and energises RELAY KR13 (101A) , KL (104A) and TIMER T13 (114A).
KR13-2 (101A) self holds RELAY KR13 (101A) and TIMER T13 (114A)

KR13-1 (87) opens to de-energise RELAYS KC (87), KCA (89) and TIMER T9 (92).
KC 1-4 (19 &20) de-energise the cam to stop the cycle with the CASSETTE LID open 10mm.
KCA-1 (58) closes
KCA-2 (87) opens
KL-1 (103A) energises SOLENOID VALVE SVl open to inject air to release the FILM in case it is stuck to the UPPER SCREEN.
KL-2 (103) closes

TIMER T13 (114A) times out and T13-1 (88) closes to re-energise RELAYS KC (87) , KCA (89) and TIMER T9 (92).

Contacts KC 1-4 (19 & 20) restart the CAM forward.
KCA-1 (58) opens
KCA-2 (87) closes to maintain cam motor forward.

MICROSWITCH MS17 (101A) de-energizes TIMER KL (104A), KR13 (101A) and T13 (114A).
KL-1 (103A) opens and de-energizes SOLENOID VALVE SV1 (104) to end the air injection.
KL-2 (103) opens
T13-1 (88) opens
KR13-1 (87) closes to maintain cam forward
KR13-2 (101A) opens

The opening cycle continues and MICROSWITCH MS3 (99A) changes over and if there is no film on the top screen FC4 (160) will be energised.
FC4-1 (99A) energises KR5 (100).
KR5-1 (105) energises KT3A (105).
KT3A-1 (88) maintains the cam forward.
KR3C-2 (152) changes over, energises KRO (152) and charges capacitor (151A).
FC4-2 (95) closes and energises KFC4A (95) and KFC4B (96).
KR5-2 (100) changes over, self holds KR5 (100), and inhibits TIMERS KL (104A) and T3 (108).
KT3A-2 (105A) closes and self holds KT3A (105).
KFC4A-1 self holds KFC4A (95) and KFC4B (96)
KFC4A-2 (122) closes
KFC4B-1 (103) open to inhibit SV1 (104).

As the CAM rotates MS3 (99A) changes over and de-energises RELAY KR3C (99A).
KR3C-2 (152) changes over to energise KRP (153) via KRO-2 (153).
KRO (152) and KRP (153) are held in for approximately 1 Sec while the capacitor discharges.
If there is a FILM covering the PATCH in the CASSETTE, the PATCH will not be seen by PHOTOCELL FC1 and KRP-1 (109) will not energise KF1 and "FILM NOT REMOVED FROM CASSETTE LAMP".

MICROSWITCH MS8 (134) operates and if FC7-1 (134) is open ie. there is a no FILM jammed in the CHUTE - or - the EXPOSED FILM MAGAZINE is not full, according to which version machine it is, the cycle continues.

MS8 deactuates.

MICROSWITCH MS2 (73) operates and energises KR2 (73) , KR2A (74), KR2B (75), KR2C (76), SOLENOID VALVE SV2 (72) and TIMERS T2 (75A) and T4 (86)

KR2-2 closes
KR2A-1 (87) opens to de-energise RELAYS KC (87), KCA (89) and TIMER T9 (92).
KC 1-4 (19 & 20) de-energise the cam to stop the cycle with the SUCKERS on the FILMS.
KCA-1 (58) closes
KCA-2 (87) opens
KR2A-2 (74) closes and self holds KR2 (73) , KR2A (74), and TIMERS T2 (75A) and T4 (86)
KR2C-2 (119) energises RELAYS KPC (119) and KM2 (120) and SOLENOID VALVE SV3 (121).
KR2C-1 (122) energises RELAYS KPM (122) and KM3 (123) and SOLENOID VALVE SV4 (124).
KM2 (6) energises the CASSETTE VACUUM PUMP M2 (6).
KM3 (7) energises the MAGAZINE VACUUM PUMP M3 (7) .
KPM-2 (123) self holds RELAYS KPM (122), KM3 (123) and SOLENOID VALVE SV4 (124).
KPC-2 (120) self holds RELAYS KPC (119), KM2 (120) and SOLENOID VALVE SV3 (121).

TIMER T4 (86) times out after 1 Sec. to allow time for the vacuums to build up to pick up the FILMS.
T4-2 (72A) energises RELAY KW (71) via MS14 (71).
Contacts KW 1-4 (13) energise the TILT MOTOR M5 (13).
During the rotation the first CAM lifts the FILM clear of the top of the stack before the second CAM rotates it into the tilt position where it is stopped by MS14 (71) opening.

TIMER T2 (75A) times out after 2 Secs.
T2-1 (86) closes to re-energise RELAYS KC (87) , KCA (89) and TIMER T9 (92).
Contacts KC 1-4 (19 & 20) restart the CAM forward.
KCA-1 (58) opens
KCA-2 (87) closes

As the Exposed film is lifted from the CASSETTE , PHOTOCELL FC1 (160) will see the PATCH in the CASSETTE and FC1-1 (53) energises KFC1C (53) and KFC1D (54).
FC1-2 (51) closes
KFC1C-1 (92) opens
KFC1D-1 (111) closes
KFC1D-2 (108) changes over.

MICROSWITCH MS7 (92) operates to check PHOTOCELL FC1 to see that the EXPOSED FILM has been picked up from the CASSETTE via KFC1C-1 (92).

MICROSWITCH MS-4 (66) operates and energises RELAYS KR4 (66), KR4A (70) ,KR4B (65) and KR4C (64).
KR4-1 (70) closes to energise RELAY KW (71) via MS13 (70).
KR4-2 (70) closes to hold RELAY KW (71).
KR4A-1 (108) closes
KR4B-2 (139) closes
KR4C-1 (87) denergises KC (87), KCA (89) & TIMER T9 (92).
KR4C-2 (65) self-holds RELAY KR4C (64) and energises TIMER T8 (101).

KC 1-4 (19 & 20) de-energise the cam to stop the cycle with leading edge of the FILM in MULTIPLE FILM DETECTOR FC8.
KCA-1 (58) closes
KCA-2 (87) open

Contacts KW 1-4 (13) energise TILT MOTOR M5 (13) to remove the tilt which is then stopped by MS13 (70) opening.

MS15 (66) opens and de-energises RELAYS KR4 (66), KR4A (70) and KR4B (65).
KR4-1 (70) opens
KR4-2 (70) opens
KR4A-1 (108) opens
KR4B-2 (139) opens

If there is not a MULTIPLE RELOAD, PHOTOCELL FC8 will still be on.

TIMER T8 (101) times out after 1 Sec. and T8-1 (86) closes to re-energise RELAYS KC (87) , KCA (89) and TIMER T9 (92).
T8-2 (97) self holds TIMER T8 (101).
Contacts KC 1-4 (19 & 20) restart the CAM forward.
KCA-1 (58) opens
KCA-2 (87) closes

As the CAM runs MICROSWITCH MS4 (66) opens.

The transport mechanism carries the FILMS to their respective destinations.

MICROSWITCH MS6 (118) closes and energises RELAY KR6 (118).
KR6-2 (119) de-energizes RELAYS KM2 (120). KM3 (123). KPC (119), KPM (122) and SOLENOID VALVES SV3 (121) and SV4 (124).
KM2 CONTACTS (6) de-energise the CASSETTE VACUUM PUMP.
KM3 CONTACTS (7) de-energise the MAGAZINE VACUUM PUMP.
KPC-2 (120) opens
KPM-2 (123) opens

SOLENOID VALVES SV3 and SV4 vent the vacuum, the FILMS are released and the exposed FILM is dropped into the RECEIVING MAGAZINE or CHUTE according to which model it is. The UNEXPOSED FILM is dropped into the CASSETTE covering the PATCH and turning FC1 (160) off.
FC1-1 (53) opens and de-energises KFC1C (53) and KFC1D (54)
FC1-2 (51) opens.
KFC1C-1 (92) closes
KFC1D-1 (111) opens
KFC1D-2 (108) changes over

MICROSWITCH MS16 (112) closes and checks that the CASSETTE was reloaded via KFC1D-1 (108).

The CAM CYCLE is completed and MS1 (33) closes, energising RELAYS KR1 (33) , KR1A (34) and KR1B (35)
KR1-1 (43) closes
KR1-2 (36) closes
KR1A-1 (87) de-energizes RELAY KC (87), KCA (89) and TIMER T9 (92).

KC 1-4 (19 & 20) de-energise the cam in home position.
KCA-1 (58) closes
KCA-2 (87) opens
KR1A-2 (90) closes
KR1B-1 (58) closes and energises RELAYS KNRA (56A), KNRB (57), KNRC (58), KNRD (59) and TIMER T5 (70).
KR1B-2 (79) closes.
KNRA-1 (106A) closes
KNRB-2 (56) closes and holds KNRA (56A), KNRB (57), KNRC (58) , KNRD (59), TIMERS T5 (70).
KNRC-2 (125) opens
KNRD-2 (117) opens

TIMER T5 (70) times out and T5-1 (56) energises RELAY KNR (56). KRN (56) is maintained by KNRB-2 (56).
KNR 1 - 4 (17 & 18) energise the CASSETTE CONVEYOR MOTOR M6 in reverse.

The returning CASSETTE interrupts PHOTOCELL FC2 (28).
FC2-1 (106A) closes and energises KA (106A),KM (106B) and T14 (118).
FC2-2 (36) closes.
KA-1 (60) energises TIMER T6 (61A) KA-2 (106B) self holds RELAY KA (106A) and KM (106B).
KM-1 (36) opens to inhibit cassette entry on the next cycle.
KM-2 (107) closes to hold RELAY KM (106B) and maintain TIMER T14 (118)

TIMER T6 (61A) times out and opens contact T6-2 (36) which de-energizes RELAY KRM (136).
KRM-1 (37) opens.
KRM-2 (40) and KRM-3 (40) [parallel contacts] open to remove the -ve line.

TIMER T14 (118) is maintained via KM-2 (107), T14-2 (107) and the low voltage interlock switches.

TIMER T14 times out and T14-2 (107) de-energizes RELAY KM (106B).

KM-2 (36) closes enabling the next cycle.

START SERIAL UNLOADING.

NOTE - Serial mode cannot be selected if the last cycle resulted in a Multiple reload.

Pressing the START SERIAL UNLOADING BUTTON S18 (115) energises RELAYS KAOT (115) and KAOT1 (116) and serial unload lamp (117).

KAOT1-1 (128) inhibits FC5 (128) [Low film alarm]

KAOT1-2 (116) self holds RELAYS KAOT (115) and KAOT1 (128) through KF1-1 (116) and KF2-2 (116) [or KNRD-2 (117) following a “failure to load or unload “cycle]

KAOT2-2 (56A) [in TIMER T6 circuit] shortens TIMER T6 timout time.

The machine continues the normal cycle of operations after entering the CASSETTE until the CAM reaches the zero position and MS-1 energises the KR RELAYS through KR1B-1 (58).

The CONVEYOR reverses and carries the CASSETTE out to interupt FC2. Instead of the normal T6 timeout of 3 seconds, the TIMER T6 times out very quickly via the 1 k resistor in the timer circuit whick has been connected by KAOT-2 (56A). Therefore TIMER T6 times out while the CASSETTE is still under FC2.
T6-2 (36) opening ends the cycle and de-energises RELAY KRM

As soon as T14 times out the next cycle commences.

After the last FILM has been removed from the MAGAZINE, another cycle will occur to unload the last film from the cassette. On this final cycle the empty MAGAZINE will cause a "Cassette not reloaded" error and will cancel serial mode by energising KF2 (112).

Contact KF2-2 (116) will drop out AOT RELAYS.

STOP SERIAL UNLOADING.

Pressing the STOP SERIAL UNLOADING BUTTON energises RELAY KG (138)

KG-1 (116) de-energizes RELAYS KAOT and KAOT1 (115-116) to allow the machine to return to a normal cycle

CASSETTE EJECT.

The CASSETTE RETURN BUTTON (54A) is inhibited during a normal cycle by KS-1 (54) and can only be used when RELAY KRM is de-energized.

To eject a CASSETTE press BELT RETURN BUTTON S21 (54A) which energises KNRE (54A), the 4700 mF CAPACITOR, RELAY KNR (56) and "CASSETTE EJECT" LAMP (56).

The DIODE (56) inhibits RELAYS KNRA etc.

CONTACTS KNR (17) energise the CONVEYOR BELT Reverse until the CAPACITOR discharges de-energizes RELAYS KNRE, KNR and the "CASSETTE EJECT" LAMP after approx. 2 secs.

Contacts KNR (17) de-energizes the CONVEYOR BELT MOTOR in reverse to stop the CONVEYOR BELT and complete the cycle.

INCORRECT FEEDING OF CASSETTE.

If the CASSETTE is entered incorrectly, PHOTOCELL FC1 does not see the REFLECTIVE PATCH on the top of the CASSETTE and does not energise RELAY KFC1.

KFC1-1 (51) remains open and leaves RELAYS KFC1A, KFC1B, KFC1C, KFC1D and KFC1E de-energised (51-54).

KFC1A-2 (43) remains closed energising TIMER T1.keeping RELAY T1A, TIMER T1 and "CASSETTE ENTERED INCORRECTLY" LAMP energised.

TIMER T1 (46) times out taking PIN 5 lo, energising RELAY KT1A (50A).
KT1A-1 (50A) self holds RELAY KT1A and "CASSETTE ENETERD INCORRECTLY" LAMP (50) energised in the memory circuit.

TIMER T1 times out after 4 secs..
KT1-1 (43) de-energizes RELAYS KN, and KNA (42-43) and "CASSETTE ENTERED" LAMP (41-45).
Contacts KN (15) de-energise the CONVEYOR BELT MOTOR M6 forward
KT1-2 (59) energises the CONVEYOR BELT MOTOR M6 in reverse.

The normal cycle continues until completion.

MULTIPLE FILM LOAD ALARM.

The normal cycle commences energising FC8 and CONVEYOR forward
CONTACT KNA-2 (139) opens to inhibit RELAY KFC8

CONTACT KNA-2 (139) closes again when the CONVEYOR stops and together the FC-4 and KR4B-1 (139) inhibits RELAY KFC8 and "MULTIPLE FILM LOAD" LAMP and ALARM BUZZER.

Note: A double FILM will take PIN 13 of PHOTOCELL FC8CHIP TCA 965 Lo, closing FC8-1.
At the point in the cycle when MICROSWITCH MS4 operates KR4B-1 (139) will energise RELAYS KFC8, KR, "MULTIPLE FILM LOAD" LAMP, BUZZER and TIMER T11.

Note: A short delay controlled by a CAPACITOR in PHOTOCELL FC8 delays the PHOTOCELL looking until the tilt is zero.

KFC8-2 self holds KFC8 and LAMP ON in the MEMORY LINE.
KR-1 (142) self holds RELAY KR and TIMER T11.
KT11-1 (143) de-energizes BUZZER when T11 times out.

CASSETTE FAILED TO OPEN.

MS5 (62) operates to check if PHOTOCELL FC3 has seen that the CASSETTE has opened.
If the CASSETTE failed to open PHOTOCELL FC3 will not energise RELAY KFC3

KFC3-1 (96A) remains open therefore RELAY KFC3A remains de-energised.
KFC3A -1 (62) energises RELAYS KRX, KRXA KT5A KR and TIMER T11(61A, 62, 63, 141 and 142).).
KRX-2 (63) self holds RELAYS KRX, KRXA KT5A KR and TIMER T11.
KT5A-2 self holds RELAY KT5A.
KRXA-2 (87) changes over to de-energise RELAY KC and energise RELAY KCR through T10-1 (91).

Contacts KCR (22) energise CAM MOTOR M7 in reverse until it reaches MS1.

MS1 energises KR1, KR1A and KR1B.
KR1B (56) energises RELAYS KNRA, KNRB, KNRC, KNRD and TIMER T5 (61) and enables RE LAY KNR.

KR1A-2 (90 energises TIMER T10 (90).

TIMER T10 times out and KT10-1 (91) de-energizes RELAY KCR.
KT10-2 (89) self holds TIMER T10.
Contacts KCR (22) open to de-energise the CAM MOTOR M7 in reverse

Note:- the timing delay of T10 ensures that the CASSETTE OPENER MECHANISM clears the CASSETTE LATCH after MS1 operates and before the CAM stops in the home position

TIMER T5 times out after 1 sec.

KT5-1 (56) energises RELAY KNR
KR-1 (142) self holds TIMER T11 and RELAY KR energised.
KT11-1 (143) energises BUZZER until TIMER T11 times out.
T5A-1 (151) energises “ABORT” LAMP.

The normal cycle continues to completion.

RESET.

The RESET BUTTON is inhibited during a normal cycle by KS-2 (80) and can only be operated when RELAY KRM is de-energised.

Pressing RESET (80) energises RELAY KB, "RESET" LAMP and RELAY KC through the DIODE (80-87)
KB-2 (79) self holds RELAY KB.
Contacts KC (19) energise CAM MOTOR back to home position and energises MICROSWITCH MS-1 and RELAY KR1.
KR1B-2 (79) opens to de-energise CAM MOTOR.

EXPOSED FILM ON UPPER SCREEN.

MS3 checks for FILM on the UPPER SCREEN
MS3 energises RELAYS KR3, KR3A, KR3B and KR3C.
KR3-1 and KR3-2 (87-88) de-energise RELAY KC.
Contact KC (19) de-energises CAM MOTOR M7.

PHOTOCELL FC4 does not see the UPPER SCREEN REFLECTIVE PATCH because it is covered by the FILM stuck to the UPPER SCREEN.
PHOTOCELL FC4 does not energise RELAY FC4-1 (95) and KFC4B. KFC4-1 (95) remains closed, energising RELAYS KFC4A AND KFC4B (95 AND 96).
KFC4A-1 (96) self holds RELAYS KFC4A, etc.
KFC4-2 (99A) remains open leaving RELAY KR5 de-energised.
KR5-1 (101) energises RELAYS KL, KR13 and TIMERS T13 and T3.

Note :- TIMER T13 has already timed out and is held in this state by KR13-2 (101B).

Air is injected in pulses controlled by the ON / OFF TIMER CIRCUIT KL which energises SOLENOID VALVE SV1 open and closed through contact KL-1 (103) to release the FILM from the UPPER SCREEN during the timing of T3.

Because the FILM failed to drop into its correct place in the CASSETTE immediately so that it could be unloaded, KFC4A-2 (122) de-energizes SOLENOID VALVE S4 to drop the UNEXPOSED FILM back into the MAGAZINE.

TIMER T3 times out after 6 secs. and energises RELAY KT3A (105).
KT3A-2 (88) energises RELAY KC.
Contacts KC (19) energise CAM MOTOR FORWARD.

The normal cycle resumes to completion.

MAGAZINE NEARLY EMPTY.

PHOTOCELL FC5 detects MAGAZINE nearly empty and energises RELAY KFC5 (128).
KFC5-1 (128) self holds RELAY KFC5, and energises "MAGAZINE NEARLY EMPTY" LAMP,

RELAY KR and TIMER T11.
KR-1 (142) self holds RELAY KR and TIMER T11.
KNA-1 (108) holds LAMP on in the memory until the next cycle.

KT11-1 energises BUZZER for the duration of TIMER T11.

MAGAZINE EMPTY.

PHOTOCELL FC-6 detects MAGAZINE empty and energises RELAY KFC6 (130).
KFC6-2 (128) inhibits "MAGAZINE NEARLY EMPTY" LAMP.
KFC6-1 (131) self holds RELAY KFC6 and energises "MAGAZINE EMPTY" LAMP, RELAY KR and TIMER T11.
KR-1 (142) self holds RELAY KR and TIMER T11.

KT11-1 energises the BUZZER for the duration of T11 TIMER.

KNA-1 (108) holds LAMP on in the memory line until the next cycle.

EXPOSED FILM MAGAZINE FULL or FILM JAMMED IN TUNNEL.

PHOTOCELL FC-7 detects MAGAZINE FULL / FILM jammed in TUNNEL (DEPENDING ON THE MODEL).

If the MAGAZINE is full or there is a FILM jammed in the TUNNEL then the PHOTOCELL will be blocked and energise RELAY KFC7 (133).
KFC7-2 (134) enables RELAY KFC7A.

MICROSWITCH MS-8 operates to check if the MAGAZINE is full or a FILM is jammed in the tunnel.
With a full MAGAZINE or FILM jammed in the TUNNEL, RELAYS KFC7A, KR, TIMER T11 and LAMP are energised through KFC7-2.
KFC7A-1 (135) self holds RELAYS KFC7A( ) and "MAGAZINE FULL" or "FILM JAMMED IN TUNNEL" LAMP on.
KR-1 (142) self holds TIMER T11 and RELAY KR.
KFC7A-2 (119) prevents exposed FILM pick up from CASSETTE.
KT11-1 (143) keeps BUZZER energised for the duration of T11 TIMER cycle.

UNLOAD FAILURE.

MS-7 operates to check if EXPOSED FILM has been picked up from the CASSETTE.

Because the FILM has remained in the CASSETTE, PHOTOCELL FC1 cannot see the REFLECTIVE PATCH on the LOWER SCREEN. Therefore contact KFC1C-2 (92) remains closed and KFC1D-1 (108) changes over to enable TIMER T8, RELAYS KR7, KR7A (92-94), KF1 and "FILM NOT REMOVED FROM CASSETTE" LAMP (108-109)

At the stage in the cycle that the CAM de-energises MICROSWITCH MS3, RELAY KR3C de-energises and KR3C-1 (151) energises RELAY KRP via KRO (153).

KRP-1 (109) energise RELAY KF1, and "FILM NOT REMOVED FROM THE CASSETTE" LAMP (108-109).

KF1-1 (110) self holds RELAY KF1 and LAMP energised via KNA-1 (108) and the memory circuit.

KF1-1 also energises TIMER T11 and RELAY KR.

KR-1 (142) self holds TIMER T11 and RELAY KR energised.

KT11-1 (143) energises BUZZER until TIMER T11 times out and opens KT11-1.

MS-7 operates to check if EXPOSED FILM has been picked up from the CASSETTE.

MS7 (92) energises TIMER T8 and RELAYS KR7 and KR7A through KFC1C-2 (92-94).

KR7A-2 (93) self holds RELAYS KR7 and KR7A.

KR7-1 (87) opens to de-energise RELAY KC (87).

KR7A-1 (122) opens to de-energise RELAYS KPM and KM3 and SOLENOID VALVE S4 to release vacuum to drop UNEXPOSED FILM back into the MAGAZINE.

Contacts KC (19) stop the CAM to enable the FILM to be dropped back into the MAGAZINE.

KR7-2 (112) enables RELAY KF2 and "CASSETTE NOT RELOADED" LAMP.

KM3 (7) de-energizes the VACUUM PUMP.

TIMER T8 (92) times out after 1 second.

KT8-2 (94) self holds TIMER T8 RELAY (92).

KT8-1 (86) energises RELAY KC.

Contacts KC (19) restart the CAM to complete the cycle.

At the end of the cycle MS16 (112) operates to check if the CASSETTE has been reloaded and energises RELAY KF2 and "CASSETTE NOT RELOADED" LAMP through KR7-2 (112 - 114)

MICROSWITCH LOCATION IN CIRCUIT DIAGRAM

MICROSWITCH	LINE	PURPOSE
MS 1	33	CAM HOME POSITION
MS 2	73	STOPS CAM TO PICK UP FILMS
MS 3	99A	CHECKS FOR FILM ON UPPER SCREEN VIA FC 4
MS 4	66	RETURNS TILT MOTOR + PAUSE FOR FC 8
MS 5	62	CASSETTE LID OPEN? - FC 3
MS 6	118	VENTS VACUUM TO DROP FILMS
MS 7	92	FILM PICKED UP FROM CASS? - FC 1
MS 8	134	FILM JAM IN TUNNEL or MAG FULL - FC7
MS 9	39	FRONT DOOR INTERLOCK - (UP TO SERIAL NUMBER 1216 ONLY)
MS 10	39	EXPOSED FILM MAGAZINE DOOR INTERLOCK (SA VERSION ONLY UP TO SERIAL NUMBER 1216 ONLY)
MS 11	39	RECEIVING MAGAZINE PRESENT - SA ONLY
MS 12	39	UNEXPOSED FILM MAGAZINE PRESENT
MS 13	70	STOPS TILT MOTOR IN HORIZONTAL POSITION
MS 14	71	STOPS TILT MOTOR IN TILT POSITION
MS 15	66	PREVENTS TILT MOTOR CYCLING - STEP BY STEP MODE.
MS 16	112	CASSETTE RELOADED? - FC 1
MS 17	101	STOPS CAM FOR FIRST INJECTOR PAUSE

SWITCH LOCATION IN CIRCUIT DIAGRAM

SWITCH	LINE	PURPOSE
CB 1	1	MAIN CIRCUIT BREAKER
S 16	78	CAM JOG SWITCH
S 17	125	UNLOAD ONLY
S 18	115	SERIAL MODE START
S 19	138	SERIAL INTERUPT
S 20	80	RESET
S 21	54A	CASSETTE EJECT
S 23	88	TIMER T 9 INHIBIT
S 24	2	KEY SWITCH
S 25	1A	LID INTERLOCK SWITCH (UP TO SERIAL NUMBER 1216)
S 25	2	LID INTERLOCK SWITCH (SERIAL NUMBER 1217 AND UP)
S 26	2	FRONT DOOR INTERLOCK (SERIAL NUMBER 1217 AND UP ONLY)
S 27	2A	RECEIVING MAGAZINE INTERLOCK - (STAND ALONE VERSION ONLY, SERIAL NUMBER 1217 AND UP ONLY)

RELAY COIL AND CONTACT LOCATION IN CIRCUIT DIAGRAM

RELAY	COIL	-1	-2	-3	-4	PCB
BUZZER	143					107A/B
COUNTER	44					
FC1	155	53	51			101A/B/C
FC2	28	106A	36			101A/B/C
FC3	155	96A				102A
FC4	155	99A	95			102A
FC5	128		129			105B
FC6	131	128	131			105B
FC7	133	134				105B
FC8	154		139			105B
KA	106A	60	106B			101A/B
KAOT	115		56A			101A/B
KA0T1	116	128	116			105B
KB	80	38	79			104A
KC	87	19	19	20	20	106B
KCA	89	58	87			103A
KCR	91	22	22	23	23	106B
KF1	108	116	110			105B
KF2	112	114	116			105B
KFC1A	51	51A	43			101A/B
KFC1B	51A	89	119			103A
KFC1C	53	92				104A
KFC1D	54	111	108			105B
KFC1E	52	96A				102A
KFC3A	96A	97	62			102A
KFC4A	95	96	122			105B
KFC4B	96	103				102A
KFC7A	134	119	135			105B
KFC8	140	116	140			105B
KG	138	116				107A/B
KL	104A	103A	103			102A

RELAY COIL AND CONTACT LOCATION IN CIRCUIT DIAGRAM

RELAY	COIL	-1	-2	-3	-4	PCB
KM	106B	36	107			101A/B
KM1	144	5				106B
KM2	120	6				106B
KM3	123	7				106B
KN	42	15	15	16	16	106B
KNA	43	108	139			105B
KNB	41	42				108A
KNR	56	17	17	18	18	106B
KNRA	56A	106A				101A/B
KNRB	57		56			102A
KNRC	58		125			104A
KNRD	59		117			105B
KNRE	54A		38			106B
KPC	119		120			104A
KPM	122		123			104A
KR	141	142	143			107A/B
KR1	33	43	36			101A/B
KR1A	34	87	90			103A
KR1B	35	58	79			102A
KR2	73		58			102A
KR2A	74	87	74			103A
KR2B	75	NO CONTACTS ON CIRCUIT				104A
KR2C	76	122	119			104A
KR3	97	87	88			103A
KR3A	98	98				102A
KR3B	99	43				101A/B/B
KR3C	99A		152			105A/B
KR4	66	70	70			105A/B
KR4A	70	108				105A/B
KR4B	65		139			105B ONLY
KR4C	64	87	65			104A ONLY

RELAY COIL AND CONTACT LOCATION IN CIRCUIT DIAGRAM

RELAY	COIL	-1	-2	-3	-4	PCB
KR5	100	105	100			102A
KR6	118		119			105A/B
KR7	93	112	87			104A
KR7A	94	93	122			104A
KR13	101A	87	101A			103A
KRO	152		153			105B
KRP	153	109				105B
KRM	36	37	40	40		101A/B
KRX	62	60	63			102A
KRXA	63	43	87			103A
KS	151	54A	80			107A/B
KSS	125	126	122			104A
KT1A	50A	50A				107A/B
KT3A	105	88	106			103A
KT5A	61A	150	61A			107A/B
KW	71	13	13	13	13	106B
T1	52	43	59			101A/B
T2	75A	86				103A
T3	108	102				102A
T4	86		72A			103A
T5	70	56	61			102A
T6	61A		36			101A/B
T7	153	71	104			104A
T8	101	86	97			104A
T9	91A	38				103A
T10	96A	91				103A
T11	143	143				107A/B
T12	36A		36			101A/B
T13	114A	88				103A
T14	118		107			101A/B